

REMARKS

Claim Amendments

Claim 27 has been amended to incorporate the limitations of claim 28. Claim 28 has been canceled, and claim 29 has been amended to depend on claim 27.

Claim Rejections

Claims 1-11, 25-31, 39-40

The Examiner rejects claims 1-11, 25-31, and 39-40 under 35 U.S.C. 103(a) as being unpatentable over U.S. patent 4,876,218 to Pessa et al. in view of U.S. patent 4,824,518 to Hayakawa et al. The Applicants respectfully disagree for the reasons discussed below.

Claim 1

Claim 1 recites the language “wherein the first layer substantially accommodates strain accumulated between the first crystal and the second crystal...” The Examiner asserts that Pessa discloses at col. 3, lines 1-60, an As layer which reads upon the Applicants’ first layer, and a Ga layer which reads upon the Applicants’ second layer. The Examiner further asserts that the As layer and Ga layer form a buffer layer, where the buffer layer cause reduction in lattice strain by creating mismatch dislocations, which reads upon the Applicants’ recitation in claim 1 of “the first layer substantially accommodates strain accumulated between the first crystal and the second crystal..” Finally, the Examiner asserts that Pessa teaches a GaAs film grown on the buffer layer, which reads upon the Applicants’ second crystal.

As noted by the Examiner, the As layer and the Ga layer form a buffer layer to cause reduction in lattice strain. However, the Examiner will note that claim 1 recites “the first layer substantially accommodates strain accumulated between the first crystal and the second crystal...” The Examiner in his analysis of claim 1, equates the As layer in Pessa with the first layer recited in claim 1. However, the As layer in Pessa does not accommodate strain. Instead, Pessa teaches that the As layer and the Ga layer form a buffer layer to cause reduction in lattice strain. The Examiner has already noted this point by asserting “The As layer and the Ga layer of atoms form a buffer layer, where the buffer layer cause reduction in lattice strain...” As such, Pessa does not disclose “wherein the first layer substantially accommodates strain accumulated between the first crystal and the second crystal...” as required by claim 1. It is therefore submitted that claim 1 is patentable. Since claims 2-11, 25-26, and 39 are directly or indirectly dependent on claim 1, claims 2-11, 25-26, and 39 are patentable for at least the same reason.

Claim 27

Claim 27 has been amended to recite the language “wherein the first layer accommodates strain accumulated between the substrate and the crystal”. As discussed above under the heading Claim 1, the combination of Pessa and Hayakawa does not disclose such a feature. It is therefore submitted that claim 27 is patentable. Since claims 29-31 and 40 are directly or indirectly dependent on claim 27, claims 29-31 and 40 are patentable at least by virtue of their dependency on patentable claim 27.

Claims 12-16 and 18-22

The Examiner rejects claims 12-16 and 18-22 under 35 U.S.C. 103(a) as being unpatentable over Pessa et al. in view of Hayakawa et al. and further in view of U.S. patent 4,897,367 to Ogasawara. Claims 12-16 and 18-22 are directly or indirectly dependent on claim 1 which is

patentable for the reasons discussed above. It is therefore submitted that claims 12-16 and 18-22 are patentable at least by virtue of their dependency on allowable claim 1.

Claims 17 and 23-24

The Examiner rejects claims 12-16 and 18-22 under 35 U.S.C. 103(a) as being unpatentable over Pessa et al. in view of Hayakawa et al. and Ogasawara and further in view of U.S. patent 5,094,974 to Grunthaner. Claims 17 and 23-24 are directly or indirectly dependent on claim 1 which is patentable for the reasons discussed above. It is therefore submitted that claims 17 and 23-24 are patentable at least by virtue of their dependency on allowable claim 1.

Claims 32-33

The Examiner rejects claims 32-33 under 35 U.S.C. 103(a) as being unpatentable over Pessa et al. in view of Hayakawa et al., Ogasawara, Grunthaner, and further in view of U.S. patent 4,330,360 to Kubiak et al. The Applicants respectfully disagree for the reasons discussed below.

Claim 32

Claim 32 recites the language "depositing a condensed layer of As₂ on the surface of the substrate...depositing a mono-layer of In atoms over the condensed layer of As₂...wherein upon completion of the step c), conditions are propitious for epitaxial growth of the InAs layer."

The Examiner in the Response to Arguments section of the Official Action states "the prior art is silent to the As layer is formed by condensing the vapor, but this feature is inherent" and refers to U.S. patent 5,538,702 to Smith et al. and U.S. patent 4,645,689 to Cox.

At page 10 of the Official Action, the Examiner also asserts "the combination of Pessa et al., Hayakawa et al. Ogasawara, and Grunthaner et al. also teaches it is impossible to lower the strength of the As molecular beam which has an extremely high pressure of 10^{-4} to 10^{-5} ...this reads on applicant's subjecting the substrate to an As_2 vapor pressure of about 0.008 Pa for forming a monolayer of In atoms."

It appears that the Examiner is asserting that it would be obvious to combine Pessa et al., Hayakawa et al, Ogasawara, and Grunthaner et al with Smith or Cox to arrive at the claimed feature of "depositing a mono-layer of In atoms over the condensed layer of As_2 ".

It is unclear to the Applicant how the Examiner can reach such a conclusion. First, it is unclear to the Applicants how the Examiner can conclude that because a reference or combination of references teaches that it is impossible to lower the strength of the As molecular beam, it would be obvious perform the step of "depositing a mono-layer of In atoms." What is the relationship between the limits of pressure in an As_2 molecular beam and depositing In atoms? The Examiner also states that "In an MBE process using group V elements, Kubiak et al teaches nominal effusion cell temperatures range from 900-1000°C for Ga and 800-840°C for In...." However, how does this disclose the step of "depositing a mono-layer of In atoms"?

The Examiner also asserts "The combination of Pessa et al., Hayakawa et al. Ogasawara, and Grunthaner et al also teaches annealing under an As_4 pressure and the buffer layer reduces dislocations between the substrate and the epitaxial, this reads on applicant's epitaxial growth does not introduce dislocation defects caused by lattice mismatch." In analyzing this limitation, the Examiner skips over the fact that the language "wherein upon completion of the step c). conditions are propitious for epitaxial growth of the InAs layer..." The completion of step c) requires "depositing a mono-layer of In atoms over the condensed layer of As_2 ." Where do the

combination of Pessa et al., Hayakawa et al, Ogasawara, and Grunthaner et al disclose this limitation?

Furthermore, where is the motivation to combine the teachings of Cox or Smith with Pessa et al., Hayakawa et al, Ogasawara, Grunthaner et al, and Kubiak to arrive at the claimed steps of “depositing a condensed layer of As₂ on the surface of substrate...depositing a mono-layer of In atoms over the condensed layer of As₂. ” As noted in MPEP 2142, to establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the references themselves or in knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings. Should the Examiner maintain this rejection, the Examiner is respectfully requested to specifically point out and clearly explain why one skilled in the art would seek to deposit a mono-layer of In atoms over the condensed layer of As₂. In addition, the Examiner is respectfully requested to clearly explain the correlation between the pressure of an As beam and forming a monolayer of In atoms in accordance with 37 C.F.R. 1.104(c)(2).

The Applicants submit that the combination of Cox, Smith, Pessa et al., Hayakawa et al, Ogasawara, Grunthaner et al, and Kubiak does not disclose the claimed limitations of “depositing a mono-layer of In atoms over the condensed layer of As₂..wherein upon completion of the step c), conditions are propitious for epitaxial growth of the InAs layer...” It is therefore submitted that claim 32 is patentable. Since claim 33 is dependent on claim 32, claim 33 is patentable at least by virtue of its dependency on an allowable base claim.

Conclusion

The Applicants respectfully submit that in light of the remarks above, all previous rejections of the claims have been overcome. Therefore, the Applicants submit that the claims are allowable

over the prior art that has been cited. Favorable consideration and prompt allowance are earnestly solicited.

The Commissioner is authorized to charge any additional fees which may be required or credit overpayment to deposit account no. 12-0415. In particular, if this response is not timely filed, the Commissioner is authorized to treat this response as including a petition to extend the time period pursuant to 37 CFR 1.136(a) requesting an extension of time of the number of months necessary to make this response timely filed and the petition fee due in connection therewith may be charged to deposit account no. 12-0415.

Reconsideration is respectfully requested.

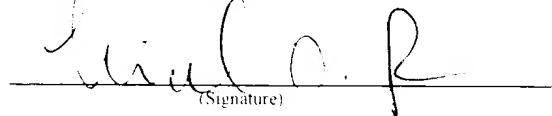
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Michael O. Rasmussen

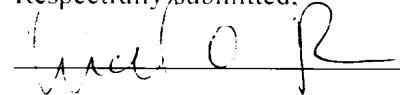
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Respectfully submitted,


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